

ASSESSMENT OF ACCIDENT HAZARD IN NIGERIAN BUILDING INDUSTRY

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ABSTRACT

The building construction industry is seen to be risky and confronted with frequent and high accident rate and ill health problems to workers, practitioners and end-users. Accident and incident reporting by construction firms to the Factories Inspectorate Department is low because most employers are ignorant of their duties. The result of this is inadequate record of accidents, increase in the frequency of accidents and eventually poor health and safety (H&S) performance of construction firms. The aim of the study is to undertake an assessment of accident hazard impact on the Nigerian building industry with a view to identifying effective accident reduction strategies. A survey through the administration of questionnaires to 436 randomly selected construction firms registered with Corporate Affairs Commission (CAC) in Abuja with a response rate of 54% was conducted. Obtained data using Mean Item score (MIS) and regression analysis were analyzed. Major findings from the study are that the most frequently recorded accidents on construction sites are accidents resulting to minor injuries of less than one day off work. Five- Core H&S practices firms were identified out of which Company's Commitment is implemented the most. The relationship between the level of implementing H&S practices and number of accidents recorded is significant; and the most effective strategies for accident reduction on construction sites are provision of "Personal protective Equipment"(PPE); "First Aid Box"; "Drinking Water"; "Adequate Work Space & Neat Environment"; and "Cloak & Toilet Service". It is concluded that recorded accidents have a significant impact in the Nigerian building industry. Recommendations from the study include that Government Agencies in charge of enforcing H&S at workplaces should give regular enlightenment on how to prevent accidents and construction firms should investigate the reasons why the number of accidents recorded is still significant while they completely implement most of the core H&S practices.

Keywords: *Accidents, Building industry, Construction firms, Health and safety.*

1.0 INTRODUCTION

The construction industry stimulates economic growth in any nation. It is therefore very vital to the achievement of socio-economic development goals of providing shelter, infrastructure and employment. In the same manner, the construction industry contributes to 11% of Gross Domestic Products (GDP) in most developing countries (Giang and Pheng, 2010). However

many construction activities are inherently health and safety (H&S) risks such as working at height, working underground, working in confined spaces and close proximity to falling materials, handling load manually, handling hazardous substances, noises, dusts, using plant and equipment, fire, exposure to electric current, poor site sanitation and workers' discomfort. In the light of the above, the construction industry is viewed to be risky and confronted with frequent and high accidents rate and ill-health problems to workers, practitioners and end-users.

The construction industry is therefore, a dangerous and highly hazardous industry due to the disproportionately high incidence of accidents and fatalities that occur on construction sites around the world (Smallwood *et al.*, 2008; Shittu *et al.* 2015a). Internationally, according to Okeola (2009) and Shittu *et al.* (2016), construction workers are two to three times more likely to die on the job than workers in other industries while the risk of serious injury is almost three times higher. This makes Health and Safety (H&S) an economic as well as social concern that requires proper management control.

In the recent past in Nigeria, especially 2005 to 2018, death tolls, permanent disability and severe environmental threat has been on the increase through collapse of buildings and major operational accidents especially in Abuja, Lagos and Port Harcourt (Awodele and Ayoola, 2005; Olatunji and Aje; 2007). For instance, according Idoro (2011) cited in Shittu *et al.* (2015b), a study of 40 contractors in Nigeria revealed that the accident and injury rates in Nigerian construction industry are high (in 2006 - the best safety ratios were 2 accidents per 100 workers and 5 injuries per 100 workers). This unfortunate scenario has been a monumental threat to productivity and the overall performance of construction projects in Nigeria. This necessitates an assessment of accidents hazard impact in the Nigerian building construction industry.

2.0 REVIEW OF RELATED LITERATURE

2.1 Concept of Health and Safety Management

According to Shittu (2016), H&S management is a crucial issue in different fields. This issue is even more crucial in the construction domain. This is because construction takes place in an open environment where many workers work under different conditions and in a confined space. This makes the industry more prone to hazards than many other industries. The Pacific Northwest Foundation (2014) defined health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. At construction sites or workplaces there is a great need for workplace health programmes in order to prevent workers from various forms of occupational illnesses. Schubert and Lehmann (2010) defined safety as the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management. Safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organisation (Civil Air Navigation Services Organisation, 2008). According to Safety Regulation Group (2010), safety management is an organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures. It is more than a manual and a set of procedures and requires safety management to be integrated into the day to day activities of the organisation. It requires the development of an organisational culture that reflects the safety policy and objectives.

A hazard is any situation or condition that has the potential to cause adverse consequences. It is something with potential to cause accident with varying severity from cut and bruises to serious illness, disability or death. A hazard identification process is the formal means of collecting,

recording, analysing, acting on and generating feedback about hazards that affect the safety of the operational activities of the organization (Belel and Mamud 2012). In an organized Safety Management System (SMS), hazard identification is an ongoing process. The scope of hazard identification is across the operational activities of the organisation with data derived from reactive and proactive schemes. Reactive schemes include data from accidents, incidents, flight data monitoring, voluntary and confidential reporting systems. Proactive schemes include open hazard reporting systems, LOSA (Line Operations Safety Audit) style normal operation assessments, safety surveys and safety assessments. Managed group sessions can also be used to proactively identify hazards. Organisations should carry out an initial hazard identification exercise on its current operations to create a baseline safety case/hazard log for the organisation and its activities that should be continuously reviewed and updated.

2.2 H&S Practices of Construction Firms

Several researches carried out previously have indicated some best practices for the improvement of the safety performance of construction firms. These practices have been described differently by different authors. A summary of some of these H&S practices is given in Table 2.1.

Table 2.1: Summary of Researches on H&S Practices (2011-2016)

Year and Authors	Summary of Research	Health and Safety Practices
Idoro (2011)	Studied the influence of mechanization on Occupational Health & Safety (OHS) performance of the Nigerian Construction Industry.	The study recommended that: * stakeholders should give more attention to OHS management plan; and, *hazard management plan in the use of plant and equipment on site should be given more priority.
Agwu (2012(a))	Studied the implications of integrating safety and social responsibility initiatives at the organizational level in the Nigerian construction industry.	The following were suggested as factors linking safety and social responsibility: * the use of ISO 26000; *holding top management accountable for safety; and, * communicating safety value to corporate stakeholders.

Agwu (2012(b))	Assessed the impact of employees' safety culture on organisational performance.	The following factors improving employees safety performance were identified: * visibility of management commitment to construction employees' safety culture; * establishment of monthly safety incentive schemes for employees; * training and retraining of employees on safe work procedure; * increase in site safety audits; and, * focusing on monthly safety meetings on employees' attitudinal change towards safety.
Belel and Mahmud (2012)	Studied safety culture of Nigerian construction workers in Yola.	It was discovered that: * Construction workers' attitude towards safety is influenced by their perception of risk, safety rules and procedures. * Lack of training of workers was ranked the most severe factor that hinders workers' safety on site. * Reduced accident cost was ranked the most important benefit of safety on site.
Okolie and Okoye (2012)	Assessed the impact of national culture on the safety climate of construction workers in South-East, Nigeria.	Four cultural factors were identified as enhancing positive behaviour of construction workers. These are: * Long Vs Small power distance; * Individualism Vs Collectivism; * Strong Vs Weak uncertainty avoidance; and, * Masculinity Vs Femininity.
Idubor and Oisamoje (2013)	Examined background of OHS practices in Nigeria by highlighting the importance of mitigating OHS challenges identified from moral, legal and financial dimensions.	Reasons for frequent violation of OHS standards and norms by the operators in Nigeria were identified as: * bribery and corruption in the system; * the Nigerian factor; * inadequate funding of monitoring institutions; * low level education of employees; and* Problems of unemployment.
Agumba and Haupt (2014)	Examined the validity and reliability of health and safety practices and respondents demographic attributes perception on these health and safety practices implementation of South African construction SMEs.	It was established that health and safety practices were valid for construction SMEs. It was also discovered that the number of years (experience) of employers/employees in an organisation and perception towards health and safety did not differ, while educational level of employer/employee in an organisation and perception towards health and safety differed.
Okolie and Okoye (2014)	Assessed the cost of health and safety performance of building contractors in Nigeria.	It was concluded that health and safety performance of contractors affects success of building projects in terms of delivery time, quality, cost and productivity.
Shittu <i>et. al.</i> (2015a)	Carried out an appraisal of health and safety practices of construction SMEs in Abuja.	60 safety practices were identified under 6 core practices. These are company's commitment, workers consultation and participation, health and safety planning, monitoring & review, communication and education & training.
Shittu <i>et. al.</i> (2016)	Researched on the impact of organisational characteristics on H&S practices of construction contractors in Nigeria.	The study identified 46 important H&S practices ranging from companies commitment to education and training.

Source: Researchers' Compilation (2016)

From the above literature compilation, the important H&S practices adopted by the Nigerian construction firms in minimising the risks of accidents on construction sites are 46. Sixteen (16) are in the context of company's commitment; eight (8) are in the context of communication, six (6) are in the context of education & training; twelve (12) are in the context of health & safety

planning; and four (4) are in the context of worker's consultation & participation. The identified H&S practices are therefore categorised under five (5) core groups.

2.3 Construction Sites Accidents and Reporting Mechanism

The sources of accidents on construction sites can be attributed to four (4) major factors. These are the design, construction, physical/environmental factors and mechanical factors (Ayininuola and Olalusi 2004). Ayininuola and Olalusi (2004) asserted that a large number of accidents have occurred in building sites due to failure of temporary or partially complete structures and poor specification. Ayininuola and Olalusi (2004) described failure as an unacceptable difference between expected and observed performance. A failure can be considered as occurring in a component when that component can no longer be relied upon to fulfill its principal function and therefore this can cause a health hazard. Ayininuola and Olalusi (2004) observed that many accidents in Nigeria have occurred in building sites due to lack of sufficient technical expertise by the builder. For instance, use of sub-standard material has led to building collapse as shown in Plate 2.1.



Plate 2.1: A collapsed building due to use of sub-standard material.
Source: Amadi *et al.* (2012)

The physical/environmental factors that can contribute to accidents at construction sites include:- rain, sun, fumes, ice vapours, unlevel or uneven surfaces, radiation, snow, fog and heat, confined space, noise, gas and humidity (Prokopenko, 1981). More so, Perry and Hayes (1985) also identified fire, earthquake, flood, landslip to be among factors that can cause accidents and health hazards at construction sites.

Vehicles and/or tractors can be a contributing factor to accident in the construction industry. The main categories of transport accidents at work include: people are struck or run over by moving vehicles (e.g. during reversing); falling from vehicles; struck by objects falling from vehicles; and injured because of vehicles overturning (Wogu, 2013). It follows that by removing or reducing the risk of accidents involving vehicles on construction sites, there can be a significant reduction in the number of fatal accidents in factories or on sites.

The Factory Inspectorate Department, according to Umeokafor *et al.* (2014a), is empowered to enforce workplace health and safety standards, ensuring that all workplaces maintain minimum standards of health and safety prescribed by the Factories Act, 1990 (Chapter 126, Volume VIII of the Laws of the Federation of Nigeria). Apart from carrying out workplace inspections, the Department also conducts workplace surveys, investigates accidents, provides some occupational health and safety information, registers factories including construction sites and proactively promotes workplace health and safety through enlightenment programmes, safety awareness, workshops, lectures and seminars. The most frequently undertaken activities of the department are general factory inspections, construction site inspections, and accident and incident investigations.

Unfortunately, reporting of accidents and incidents to Factories Inspectorate Department was low because most employers were ignorant of their duties under the Part IV of the Factories Act 1990 and partly, for the fact that some employers were not aware of the different roles played by the Factory Inspectorate and Labour Department (Umeokafor *et. al.*, 2014b).

This is very evident from the numbers of accidents reported to the Factory Inspectorate Department which is shown in Table 2.2. Dangerous occurrences, fatal and over three-day accidents are reportable to the Factory Inspectorate Department. Most employers do not report these reportable incidents as also shown in Table 2.2.

Table 2.2: Accidents Reported to Factory Inspectorate Department from 2007 to 2012

Year	Number of Injuries	Number of Deaths	Number of Near Misses	Number of Accidents Reported
2007	4	1	1	3
2008	8	6	0	2
2009	3	2	0	16
2010	5	1	1	3
2011	8	2	0	7
2012	14	4	1	6

Source: Adapted from Umeokafor *et al.* (2014b)

Plate 2.2 is a picture showing evidence of an accident which could have been prevented if there was proper registration of site by the contractor and site inspection by the Factory Inspectorate Department.



Plate 2.2: A typical Work Place Accident preventable through regular Factory and Labour Inspections

Source: Wogu (2013)

2.4 Strategies for Reducing Frequency of Accidents on Construction Sites

Health refers to the protection of bodies and minds of people from illness resulting from materials, process or proceedings used in the workplace whereas safety is protection of people from physical injury (Hughes and Ferret, 2008). From the definition above, H&S practices involve economic and humanitarian concerns. It therefore requires proper control and management because construction managers are of the belief that engaging H&S practices on site increases the cost and reduces profit of the construction project, but according to Loewenson (1998), occupational injury, illness and fatality currently accounts for significant losses, with over 3% GDP losses annually due to these causes. This means investments in occupational H&S can bring gains in productivity and market access (Loewenson, 1998). Okolie and Okoye (2012) reported that the importance of safety practices on construction sites and safety of construction workers can never be over emphasized, because when accidents happen on sites, they cause many human tragedies, de-motivate workers, disrupt site activities, delay project progress, and affect overall project cost, productivity and reputation of the firms concerned.

In the light of the above, certain practices have been identified as effective measures for reducing the frequency of accidents on construction sites. In line with this, Kheni (2008); Kheni *et al.* (2008) and Shittu (2016) identified some basic H&S procedures which are also major requirements in the Conditions of Contract and are measures capable of reducing the frequency of accidents on construction sites. These measures are summarized in Table 2.3.

Table 2.3: Basic Measures for Reducing the Frequency of Accidents on Sites

S/NO	Accident Reduction Measures
1	Provision of First Aid Box
2	Provision of Drinking Water
3	Provision of Cloak & Toilet Service
4	Provision of Canteen
5	Provision of Adequate Work Space & Neat Environment
6	Provision of Personal Protective Equipments (PPE)
7	Provision of Insurance Cover for Site & Employee
8	Designated H&S Personnel
9	Formal H&S Policy
10	Provision of Accident Reporting Procedure

Source: Researchers' Compilation (2016)

From Table 2.3, ten (10) basic measures capable of reducing the frequency of accidents on sites have been identified by this research. The application of the procedures contained in Table 2.1 is clearly contained contract clauses and conditions of contract for specific projects.

2.5 Problem Identified from Review of Literature

The review of related literature in this study has shown that accident and incident reporting by construction firms to the Factories Inspectorate Department was low because most employers were ignorant of their duties under the Part IV of the Factories Act 1990. This is partly, due to the fact that some employers were not aware of the different roles played by the Factory Inspectorate Department and Labour Department. Therefore, the result of this is inadequate record of accidents, increase in the frequency of accidents and eventually poor H&S performance

of construction firms. In view of this, the aim of the research is to undertake an assessment of accidents hazard impact in the Nigerian building industry with a view to identifying effective accident reduction strategies. The following objectives assisted in the achievement of this aim.

- i. To present the trend of construction sites accidents for a five-year period (2009 - 2013).
- ii. To identify the basic H&S practices guiding the activities of construction firms on sites.
- iii. To determine the relationship between the level of implementing basic H&S practices and the frequency of accidents on construction sites.
- iv. To identify strategies for reducing the frequency of accidents on construction sites.

3.0 METHODOLOGY

This study adopted the quantitative research approach. Data collection was through the use of structured questionnaires on a 3-point scale. The use of both descriptive and inferential methods of analysis was employed in the study. This involves a simple survey of some building construction firms in Nigeria. The population for the study constitutes the number of construction firms registered with Abuja’s business addresses with CAC in Abuja. This population size was 2219. The sample frame for the study was the list obtained from CAC Headquarters, Abuja, which shows the population characteristics. The sample size for this research based Watson’s (2001) formula (equation 1) is 436. The sampling approach adopted for the study is the random sampling technique.

$$n = [P(1-P) / \{A^2/Z^2\} + \{P(1-P)/N\}] \div R \text{ ----- (1)}$$

Where n = sample size required, N = number of samples in the population,
P = estimated variance in population, as a decimal: (i.e. 0.5 for this study),
A = Precision desired, expressed as a decimal (i.e. 0.05 for 5% used in this study),
Z = Based on confidence level: 1.96 for 95% confidence was used for this study

Abuja was chosen as the study area because it is the capital city of Nigeria where both indigenous and multinational construction companies execute most of their projects in Nigeria (Kadiri *et al.*, 2014). This is because a reasonable number of construction activities take place

there. This was due to the fact that Abuja experiences rapid population increase and new developmental projects daily as a result of rapid urbanisation and rural-urban migration. This leads to increase in demand for shelter for both residential and commercial purposes.

The number of questionnaires distributed for the study was 436 out of which 235 were returned and found to be useful for analysis. The response rate was therefore 54%. Ankrah (2007) who had a response rate of 15.42% reported that the response rate norm for postal questionnaire surveys is 20 – 30%. Others are Hung (2003), Ankrah (2007), Kheni (2008) and Ikpe (2009) with response rates of 7.3%, 15.42%, 32.42% and 15.8% respectively. In addition, 15.72% was the response rate in the study of Agumba and Haupt (2014) where questionnaires were both self – administered and administered by mail. This justifies that the response rate in this study is adequate.

The study employed the use of bar chart to present the trend of construction sites accidents from 2009 – 2013. The use of Mean Item Score (MIS) was employed to rank the level of implementing the important H&S practices identified while the identified strategies for reducing sites accidents were also ranked using MIS in order of effectiveness. The relationship between the level of implementing H&S practices and number of site accidents recorded was determined with the use of regression analysis with the aid of the IBM SPSS 20.0 software. In order to employ the use of regression analysis to achieve the third objective of the study, the following pair of hypotheses were formulated:

H₀: There is no significant relationship between the level of implementing basic H&S practices and the frequency of accidents on construction sites.

H₀₁: There is significant relationship between the level of implementing basic H&S practices and the frequency of accidents on construction sites.

The decision rule for the MIS analysis is given in Table 3.1.

Table 3.1: Decision Rule for MIS Analysis

Rank	Cut-off Point	Decisions	Remark
3	2.50 - 3.00	Completely	Effective
2	1.50 - 2.49	Partially	Fairly Effective
1	1.00 - 1.49	Not at all	Not Effective

Source: Adapted and modified from Morenikeji (2006)

4.0 RESULTS AND DISCUSSIONS

4.1 Trend of Accidents Record of Construction Firms from 2009 - 2013

Figure 4.1 presents the trend of accidents record of the construction firms in terms of severity for a five-year period (2009 - 2013).

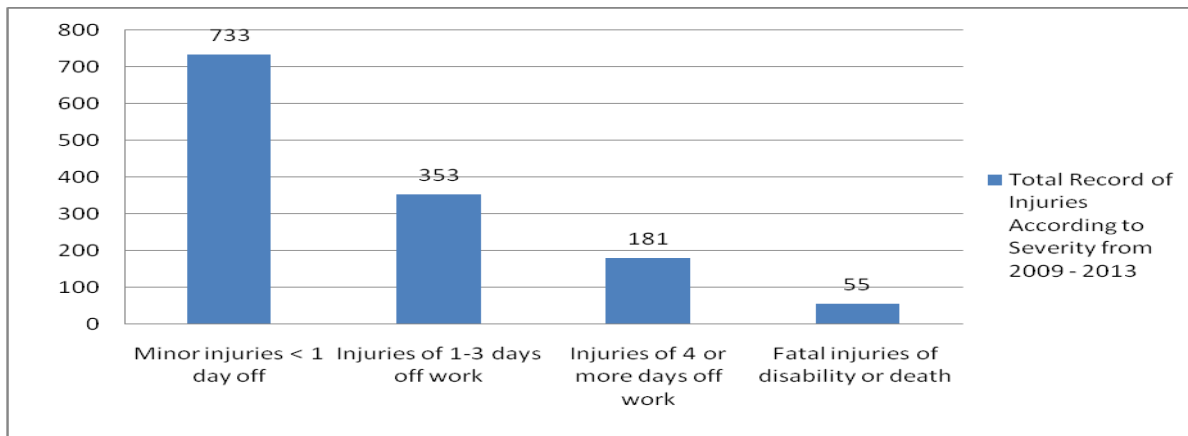


Fig. 4.1: Total Record of Injuries According to Severity from 2009 – 2013

It was revealed from Figure 4.1 that over the five-year period accidents, resulting to minor injuries of less than one day off work summed to 733 cases; accidents leading to injuries of 1 – 3 days off work summed to 353 cases; accidents resulting to injuries of 4 or more days off work amounted to a total of 181 cases; and accidents leading to permanent disabilities or death summed to 55 cases only. This is in line with the studies of Shittu *et al.* (2015a & b) and Shittu

(2016) where it was also found that the frequency of accidents decreases with the rate of severity.

4.2 Level of Implementing H&S Practices by Construction Firms

The review of literature in this study revealed 46 important health and safety (H&S) practices. These H&S practices were categorised into five core practices which are *Company's Commitment, H&S Communication, H&S Planning, Workers' Consultation and Participation* and *H&S Education and Training*. The results of the level of implementing of these H&S practices of construction firms are summarised in Tables 4.1 – 4.5.

Table 4.1: Level of Implementing Company's Commitment

S/No	Health And Safety Practices	MIS	St. Dev	Rank
1	Provision of personal protective equipment	2.855	0.418	1st
2	Provision of first aid box	2.847	0.454	2nd
3	Provision of drinking water on site	2.843	0.438	3rd
4	Provision of adequate work space and neat environment	2.792	0.474	4th
5	Provision of cloak and toilet	2.723	0.526	5th
6	Provision of canteen service on site	2.643	0.591	6th
7	Existence of formal health and safety policy	2.540	0.751	7th
8	Keeping of safety record keeping and follow-ups	2.540	0.692	8th
9	Having a designated safety personnel	2.464	0.739	9th
10	Provision of procedures for reporting accidents	2.451	0.715	10th
11	Provision of procedures for investigating accidents and nearmisses	2.392	0.732	11th
12	Having fire protection programme	2.357	0.804	12th
13	Existence of minimization policy for cost of ill-health and injury	2.209	0.796	13th
14	Use of ISO 26000 to identify social responsibilities of employees	2.068	0.769	14th
15	Implementing employee drug testing	2.026	0.835	15th
16	Using outside health and safety consultants	1.723	0.764	16th
Average MIS		2.50		

Source: Researchers' Field Survey (2016)

Table 4.1 shows that the H&S practices implemented the most under "Company's Commitment" are "Provision of Personal Protective Equipment" (MIS = 2.855) and "Provision of First Aid Box" (MIS = 2.647). The least ranked H&S practices is "Using Outside H&S Consultants" (MIS = 1.723).

Table 4.2: Level of Implementing Workers' Consultation and Participation

S/No	Health And Safety Practices	MIS	St. Dev	Rank
1	Rewarding workers who demonstrate exemplary safe behaviour on site	2.409	0.661	1st
2	Involving workers to participate in hazard identification on sites	2.387	0.732	2nd
3	Asking workers for their ideas on health and safety matters	2.323	0.725	3rd
4	Consulting trade union representatives on health and safety matters	1.996	0.858	4th
Average MIS		2.30		

Source: Researchers' Field Survey (2016)

It was revealed from Table 4.2 that the H&S practice implemented the most under “Workers’ Consultation and Participation” is “Rewarding workers who demonstrate exemplary safe behaviour on site” (MIS = 2.409). The least ranked H&S practices is “Consulting trade union representatives on health and safety matters” (mean score = 1.996).

Table 4.3: Level of Implementing H&S Communication

S/No	Health And Safety Practices	MIS	St. Dev	Rank
1	Using verbal communication with operatives during site tours.	2.736	0.552	1st
2	Discussing health and safety during site meetings	2.715	0.513	2nd
3	Using health and safety posters and other signs to give safety education	2.613	0.597	3rd
4	Communicating health and safety performance to employees	2.468	0.648	4th
5	Focusing your monthly safety meetings on employees' attitudinal change towards safety	2.383	0.651	5th
6	Communicating health and safety through company newsletter	2.319	0.775	6th
7	Communicating safety value to corporate stakeholders and use of two-way safety communication	2.213	0.759	7th
8	Networking with other companies/institutions	1.962	0.806	8th
Average MIS		2.42		

Source: Researchers' Field Survey (2016)

Table 4.3 shows that the H&S practice implemented the most under “H&S Communication” is “Using verbal communication with operatives during site tours” (MIS = 2.736). The least ranked H&S practices is “Networking with other companies/institutions” (MIS = 1.962).

Table 4.4: Level of Implementing H&S Planning

S/No	Health And Safety Practices	MIS	St. Dev	Rank
1	Price health and safety in preliminaries	2.723	0.542	1st
2	Ensuring adequate welfare provisions on site	2.711	0.523	2nd
3	Documenting method statements	2.643	0.646	3rd
4	Providing insurance cover for sites and Employer-paid group insurance plan	2.643	0.619	4th
5	Identifying hazards on sites before work commences	2.528	0.667	5th
6	Providing emergency response plan	2.519	0.641	6th
7	Exercising disciplinary measures to correct wrong behaviours relating to health and safety	2.464	0.654	7th
8	Documenting risk assessments	2.380	0.725	8th
9	Carrying out safety pre-task planning	2.375	0.716	9th
10	Carrying out post-accident investigation	2.358	0.772	10th
11	Providing job hazard analysis	2.319	0.747	11th
12	Obtaining a labour certificate for every contract	2.102	0.787	12th
Average MIS		2.48		

Source: Researchers’ Field Survey (2016)

Table 4.4 revealed that the H&S practice implemented the most under “H&S Planning” is “Pricing health and safety in preliminaries” (MIS = 2.723). The reason for this might be because the construction firms might engage in this practice in order to just comply with the requirements in the conditions of contract. The least ranked H&S practices is “Obtaining a labour certificate for every contract” (MIS = 2.102).

Table 4.5: Level of Implementing H&S Education and Training

S/No	Health And Safety Practices	MIS	St. Dev	Rank
1	Organizing orientation on safety for new workers	2.592	0.648	1st
2	Organizing site inductions for operatives	2.528	0.641	2nd
3	Organizing health and safety training and retraining for supervisors and/or senior management	2.502	0.674	3rd
4	Organizing health and safety training of operatives - first aid, manual lifting etc	2.481	0.641	4th
5	Organizing toolbox talks	2.315	0.725	5th
6	Organizing alcohol- and substance-abuse programme	2.043	0.738	6th
Average MIS		2.41		

Source: Researchers’ Field Survey (2016)

Table 4.5 revealed that the H&S practice implemented the most under “H&S Education and Training” is “Organizing orientation on safety for new workers” (MIS = 2.592). The least ranked H&S practice here is “Organizing alcohol- and substance-abuse programme” (MIS = 2.043).

The results of the MIS of the level of implementing H&S practices agrees with those of Kheni (2008), Agumba and Haupt (2014), Shittu *et al.* (2016) and Shittu (2016) where it was also discovered that the H&S practices of firms are capable of improving their safety performance.

4.3 Relationship between Level of Implementing H&S Practices and Number of Accidents Recorded

The regression analysis was carried out to determine the relationship between the level of implementing H&S practices by construction firms and number of recorded accidents. Results of the regression analysis are presented in Table 4.6.

Table 4.6: Results of Regression Analysis

Anal ysis No.	Variables		Type of Model	Observations					Inferences		
	X	Y		Regression Equation	R/R ² (%)	F _{cal}	F _{tab}	P _{value}	Strengt h of Relatio nship	Rem ark	Action On Hypothe sis
1a	Implem entation of H&S Practice s	Number of Acciden ts	Linear (Simpl e)	Y = -24.713 + 27.383x	27/7	17.5 37	3.84	0.00 0	Weak	SS	Reject H ₀
1b	Implem entation of H&S Practice s	Number of Acciden ts	Logarit hmic	Y = -9.986 + 59.795ln(x)	26/7	17.1 27	3.84	0.00 0	Weak	SS	Reject H ₀
1c	Implem entation of H&S Practice s	Number of Acciden ts	Quadra tic	Y = -16.696 + 20.025x + 1.610x ²	27/7	8.73 6	3.84	0.00 0	Weak	SS	Reject H ₀

Source: Researchers’ Field Survey (2015)

Key:

SS = Statistically Significant

Table 4.6 shows that there exists a weak and significant relationship between the level of implementing H&S practices and number of accidents recorded. The value of the coefficient of correlation (R) observed was 27%, indicating a weak correlation between the variables. The coefficient of determination (R^2) value observed was 7%, also indicating a weak relationship. The value of F calculated of 17.537 observed is greater than the value of F tabulated of 3.84, while the Probability (P) value of 0.000 observed is less than 0.05. The null hypothesis is rejected based on this. The findings of the regression analysis however disagrees with the findings of Kheni (2008), Agumba and Haupt (2014), Shittu *et al.* (2016) and Shittu (2016) where it was also discovered that the H&S practices of firms are capable of improving their safety performance.

4.4 Strategies for Reducing Number of Accidents on Sites

The review of literature in this study revealed ten (10) major strategies for reducing the number of accidents on construction sites by construction firms. These strategies emanate from the important H&S practices of construction firms. The result of the ranking of these strategies in order of effectiveness on a 3 – point scale is presented in Table 4.7.

Table 4.7: strategies for Reducing Construction Site Accidents

S/No.	Strategies for Reducing Accidents	MIS	St.Dev	Rank	Decision
1	Provision of PPE	2.8553	0.4181	1st	Effective
2	Provision of First Aid Box	2.8468	0.4542	2nd	Effective
3	Provision of Drinking Water	2.8426	0.4384	3rd	Effective
4	Provision of Adequate Work Space & Neat Environment	2.7915	0.4739	4th	Effective
5	Provision of Cloak & Toilet Service	2.7234	0.5260	5th	Effective
6	Provision of Insurance Cover for Site & Employee	2.6426	0.6188	6th	Effective
7	Provision of Canteen	2.6426	0.5906	7th	Effective
8	Having Formal H&S Policy	2.5404	0.7505	8th	Effective

9	Designated HSE Personnel	2.4638	0.7393	9th	Fairly Effective
10	Provision of Accident Reporting Procedure	2.4511	0.7151	10th	Fairly Effective
<i>Average MIS</i>		<i>2.6800</i>			

Source: Researchers' Field Survey (2016)

It was revealed from Table 4.7 that eight (8) of the strategies identified for reducing number of accidents recorded on sites are effective. These strategies are "Provision of PPE"; "Provision of first aid box"; "Provision of drinking water"; "Provision of adequate work space & neat environment"; "Provision of cloak & toilet service"; "Provision of insurance cover for site & employees"; "Provision of Canteen"; and "Having formal H&S policy" with MIS of 2.8553, 2.8468, 2.8426, 2.7915, 2.7234, 2.6426, 2.6426 and 2.50404 respectively. "Having designated H&S personnel on sites" (MIS = 2.4638) and "Provision of accident reporting procedure" (MIS = 2.4511) were discovered to be fairly effective strategies for reducing accidents on sites. On the average all the strategies identified are effective in the ability to reduce the number of accidents on sites (average MIS = 2.6800). The results of this analysis agrees with the findings of Ibijoju (2016) where it was found that the procedures identified for addressing emergency issues on construction sites are very effective and capable of reducing the rate of construction sites accidents.

5.0 CONCLUSION AND RECOMMENDATIONS

This paper focused on the assessment of accident hazard in Nigerian Building Industry. It emphasized that Organizations should carry out an initial hazard identification exercise on its current operations to create a baseline safety case/hazard log for the organization. In view of the findings from the analysis of data from this research, the following conclusions were made:

- i. The most frequently recorded accidents on construction sites are accidents resulting to minor injuries of less than one day off work.

- ii. Five core H&S practices guiding the activities of construction firms were identified out of which Company's Commitment is implemented the most.
- iii. The relationship between the level of implementing H&S practices and number of accidents recorded is significant.
- iv. The most effective strategies for accident reduction on construction sites are provision of "PPE"; "First Aid Box"; "Drinking Water"; "Adequate Work Space & Neat Environment"; and "Cloak & Toilet Service".
- v. Finally, recorded accidents have a significant impact in the Nigerian building industry.

In the light of the conclusions made in the study, the following recommendations were made:

- i. There is a need for the Government Agencies in-charge of enforcing H&S at workplaces to give regular enlightenment on how to prevent accidents, especially those resulting to minor injuries of less than one day off work which is the highest recorded, at workplaces and construction sites particularly.
- ii. The management of construction firms should try to always draft out formal H&S policies that will incorporate the five core H&S practices, especially those that have been identified as effective accident reduction strategies, in order to reduce accident frequency on construction sites.
- vi. Construction firms should investigate the reasons why the number of accidents recorded is still significant while they completely implement most of the core H&S practices identified as effective accident reduction strategies in order to reduce impact of recorded accidents on construction sites.

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